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Docket No: 01313/100F022-US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Harding et al.

Serial No.: 09/557,804

Art Unit: 1623

Confirmation No.: 8941

Filed: April 25, 2000

Examiner: E. White

**For: CELLULOSE ETHERS AND METHOD OF PREPARING THE SAME**

## REPLY BRIEF

**Mail Stop Appeal Brief - Patents**  
**Commissioner for Patents**  
**P.O. Box 1450**  
**Alexandria, VA 22313-1450**

Sir:

This Reply Brief is responsive to the Examiner's Answer dated March 24, 2004 and is submitted in triplicate. A Request for Oral Hearing is submitted concurrently herewith.

No fee is believed due with this Reply Brief. If, however, any fee is due, the Commissioner is authorized to charge it to Deposit Account No. 04-0100.

In the Examiner's Answer, the Examiner has misconstrued the pending product-by-process claims and not properly considered the evidence of non-obviousness provided by appellants.

The Process Limitations of a Product-By-Process Claim Provide a Fingerprint of the Product

In his Answer, the Examiner contends:

Appellant argues against the rejection on the ground that the instantly claimed carboxymethyl cellulose (CMC) is somehow different because of the process used to produce the product. This argument is not persuasive since process limitations cannot impart patentability to a product that is not patentably distinguished over the prior art.

Process limitations, however, are pertinent to the patentability of a product to the extent the process imparts features that render the product novel and non-obvious.

A product-by-process claim merely uses one statutory class of invention (i.e., process limitations) to define or fingerprint another statutory class (i.e., the product) which is not readily susceptible to definition solely by structure or physical characteristics. As the court indicated in *In re Thorpe*, 777 F.2d 695, 227 USPQ 964 (Fed. Cir. 1985) citing *In re Brown*, 459 F.2d 531, 173 USPQ 685, 688 (CCPA 1972) and *In re Pilkington*, 411 F.2d 1345, 162 USPQ 145 (CCPA 1969):

Product-by-process claims are not specifically discussed in the patent statute. The practice and governing law have developed in response to the need to enable an applicant to claim an otherwise patentable product that resists definition by other than the process by which it is made. For this reason, even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. (citations omitted)

*Ex parte Lyell*, 17 USPQ2d 1548, 1552 (BPAI 1990).

For example, in *In re Pilkington*, 411 F.2d 1345, 1348-1349 (CCPA 1969), the predecessor to the Court of Appeals for the Federal Circuit found a claim directed to a glass sheet made by a particular process patentable because the glass sheet had better surface perfection and freedom from internal stress than the glass sheets of the cited prior art. The claim at issue in *Pilkington* did not recite any structural features of the glass sheet. It was the product of the process recited in the claim, not the product made by any process, which was compared to the prior art. See *In re Thorpe*, 777 F.2d at 697 ("Thorpe does not assert that the *product of his process* is different from the product of the prior art." (italics added)). If the process recitations in a product-by-process claim have no weight, a patent applicant could not obtain a patent on a new form of an old product that could only be characterized by the process for making it. This is an absurd result, and is not the law.

Like in *Pilkington*, appellants have discovered a new form of a known product, i.e., a new form of carboxymethyl cellulose (CMC). Also, as in *Pilkington*, appellants have claimed the new form of CMC in terms of its process to provide a fingerprint of the product.

Therefore, the process recited in the pending claims must be considered to the extent it provides novel and non-obvious features to the product. These features include the increased viscosity of the CMC product, compared to similar CMC's of the prior art.

**The Process Recited in the Pending Claims is Different Than That in Mansikkamaki**<sup>1</sup>

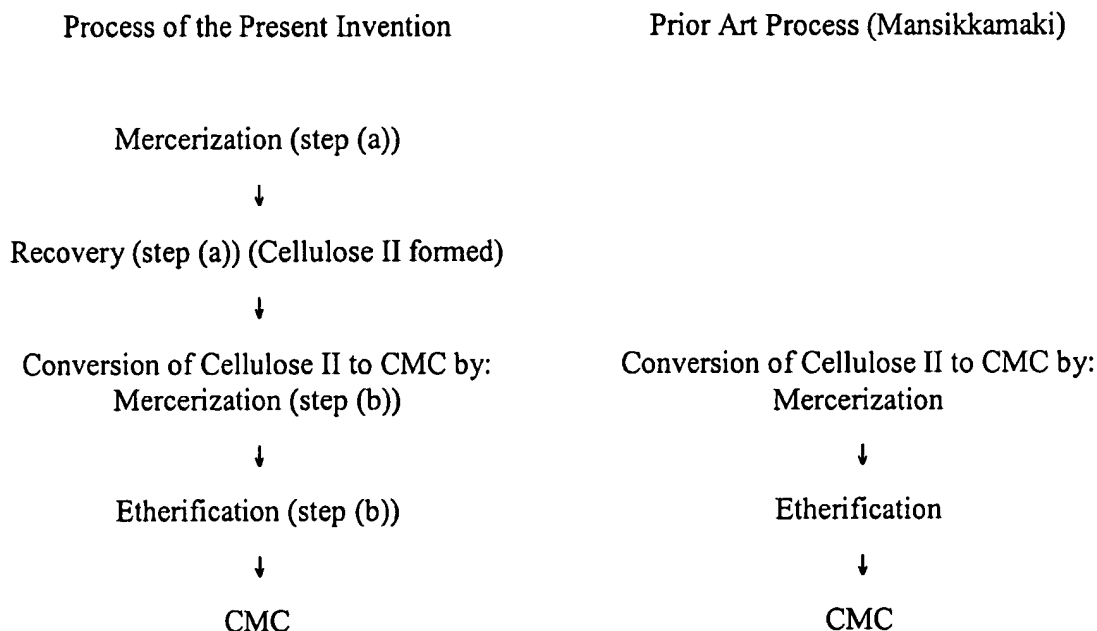
The Examiner argues that the process and starting material for making CMC set forth in Mansikkamaki is within the scope of the process recited in the pending claims (see, for example, the sentence spanning pages 4 and 5 of the Examiner's Answer). This is not the case.

The presently claimed process requires converting mercerized and recovered (i.e., pre-mercerized) cellulose pulp into CMC. The pre-mercerized cellulose pulp, also known as cellulose II, has a different crystal structure than native cellulose pulp, which is known as cellulose I. See Sarko et al., "Crystalline Alkali-Cellulose Complexes as Intermediates During Mercerization", pages 169-177 written as Chapter 9 of The Structures of Cellulose, Rajai H. Atalla, Editor, ACS Symposium Series Volume 340, American Chemical Society, Washington, DC, 1987 (Exhibit 2 to the January 15, 2003 Appeal Brief). Cellulose II is prepared by mercerization (i.e., treating cellulose pulp with alkali to form alkali cellulose) and recovering it. It is the recovery of the cellulose pulp which produces the final irreversible transformation to cellulose II.

Conversion or derivatization of cellulose pulp to CMC is a well known process. The first step of the process is the formation of an alkali cellulose. This is followed by etherification of the alkali cellulose. The etherification is performed in the presence of the alkali. In other words, the cellulose pulp is not recovered after the alkali is added and before the etherification is performed. Therefore, the conversion process does not involve mercerizing and recovering the cellulose pulp as recited in step (a) of the claimed process. This conversion process is the same as that described in Mansikkamaki.

<sup>1</sup> In the Examiner's Answer, EP 879827 is referred to as "Mansikkamki" rather than "EP '827" as in the (continued...)

The process in Mansikkamaki does not, however, use pre-mercerized cellulose pulp. The cellulose pulp in Mansikkamaki is only mercerized once - not twice as in the process of the present invention. See the diagrams below comparing the process of the present invention to that of Mansikkamaki.



Therefore, the cellulose pulp which is mercerized, etherified, and neutralized in Mansikkamaki is native cellulose (**cellulose I**), whereas that in the presently claimed process is cellulose II.

The Examiner further argues that Mansikkamaki discloses CMC "derived from sulphite softwood pulp ... which is analogous to the softwood kraft cellulose pulp used in the preparation of instant claims 39 and 60-64." "Kraft" pulp, however, is different than "sulphite"

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(...continued)


Appeal Brief filed January 15, 2003. For simplicity, appellants refer to this document as "Mansikkamaki".










  
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# HANDBOOK OF PULP & PAPER TERMINOLOGY

*A Guide To Industrial and Technological Usage*

by Gary A. Smook

 ANGUS WILDE PUBLICATIONS  
Vancouver  Bellingham

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Published by: Angus Wilde Publications  
481 West 21st Avenue  
Vancouver, B.C.  
V5Y 2E6

Available in Angus Wilde Publications  
the USA from: P.O. Box 1036  
Bellingham, WA 98227-1036

**Canadian Cataloguing in Publication Data**

Smook, G.A. (Gary A.), 1934-  
Handbook of Pulp and Paper Terminology

ISBN 0-9694628-0-8

1. Paper making and trade—terminology.
2. Wood-pulp industry—terminology. I. Title.

TS1085.S66 1990 676'.03 C90-091417-3

**KRAFT PROCESS:** Alkaline chemical pulping process using sodium hydroxide (NaOH) and sodium sulfide ( $\text{Na}_2\text{S}$ ) as the active cooking chemicals. The process is noted for producing the strongest pulps. The word kraft means strength in both German and Swedish. Syn. Sulfate Process.

**KRAFT PULP:** Pulp manufactured by the kraft process. Syn. Sulfate Pulp.

## L

**LEACH CASTER:** Wooden tank with a perforated bottom into which is dumped the high-yield cook from a spherical digester. Excess liquor is drained away and the cooked chips are then plowed by means of revolving sweep arms toward an opening, from which the chips are conveyed to refiners for defiberization.

**LEVEL TANK:** Surge tank within the Kamyr continuous digester system between the chip chute circulation and the makeup liquor pump.

**LIGNOSULFONATES:** Compounds formed during sulfite cooking by the reaction of sulfurous acid or bisulfite ion with the lignin in the wood. These compounds are soluble in the cooking liquor.

**LIGNOSULFONIC ACID:** Organic sulfonic acid formed during sulfite pulping by reaction between lignin and sulfite or bisulfite ions.

**LIMING UP:** Precipitation and deposition of calcium compounds in a digester due to carrying out calcium acid sulfite cooks at too high pH.

**LIQUOR:** Term used to designate the liquid phase when other phases are present.

**LIQUOR CHARGE:** Weight (or volume) of white liquor and/or black liquor added to a batch digester for a cook. See also FREE LIQUOR.

**LIQUOR CIRCULATION:** Movement of cooking liquor through the chip mass during a cook, either by convection or pumping. When a pump is employed, the liquor is usually extracted through strainer plates, pumped through a heat exchanger and returned to different points in the digester.

**LIQUOR FILLING:** Operation in which white and black liquors are added to a batch digester, usually from measuring tanks.

**LIQUOR PENETRATION:** See IMPREGNATION.

**LIQUOR-TO-WOOD RATIO:** Ratio of the weight of cooking liquor charged (including moisture in the

wood) to the weight of oven dry chips charged, an important control parameter in any chemical cooking process. Syn. Liquid-To-Wood Ratio.

**LIQUOR TRAP:** Type of entrainment separator, usually of cyclonic design, which removes liquid droplets and/or solid particles from a gas stream, e.g., from digester relief gases.

**LOW-LIGNIN PULPING:** Proposed modification of kraft pulping to produce softwood pulp of 20 kappa number by supplementing kraft liquor with anthraquinone and increasing effective alkali charge and sulfidity.

**LOW-PRESSURE FEEDER:** Tapered star feeder with six pockets that feeds chips from atmospheric pressure to approximately 20 psig as they enter the steaming vessel of a Kamyr digester system.

## M

**MAGNEFITE PROCESS:** Proprietary magnesium bisulfite pulping and recovery process.

**MAGNESIA:** Magnesium oxide.

**MAGNESIUM BASE LIQUOR:** Bisulfite cooking liquor containing magnesium bisulfite [ $\text{Mg}(\text{SO}_3)_2$ ] as the principal active cooking chemical.

**MAGNESIUM OXIDE:** (MgO) Entrained inorganic residue formed during the combustion of magnesium bisulfite waste liquor which is recovered and reacted with sulfur dioxide to reconstitute the magnesium base cooking liquor. Syn. Magnesia.

**MAKEUP CHEMICAL:** Chemical which is added to a chemical pulping system in order to replace losses, e.g., saltcake in the kraft system, to compensate for soda and sulfur losses.

**MASONITE PULPING PROCESS:** Pulping process to convert wood chips into a fibrous raw material for fiberboard. The chips are first softened by relatively low-pressure steam (350 psig, 430°F) and then elevated to high pressure (about 1000 psig, 540°F) before being discharged through a slot (down to atmospheric pressure) where the chips are exploded and shredded into a mass of fiber bundles.

**M & D DIGESTER:** Continuous digester designed by Messing and Durkee and manufactured by C.E. Bauer. It consists essentially of an inclined tube with a length-wise midfeather around which conveyor flights are carried. Retention time of the pulping raw material can be precisely controlled by the speed of the conveyor.

Commercial application is  
and some nonwood cellu-

**BS:** Bisulfite cooking liq-  
sulfite ( $\text{NaHSO}_3$ ) as the  
chemical.

**BS:** See SODA ASH.

**BSFIDE:** See HYDRO-

**BS:** ( $\text{NaOH}$ ) Active chem-  
ical pulping processes.

**BSO:** Anhydrous sodium  
sulfide is typically used as  
equivalent weights of all  
used in the kraft mill.

**BS:** SALTCAKE.

**BS<sub>2</sub>S:** Active chemical in  
Sodium sulfide in solu-  
tion hydrosulfide and

term for a cook that has

which is soluble over the  
used in sulfite pulping. Of  
ammonium and calcium  
intermediate and calcium  
low pH.

Chemical pulping proc-  
ess other cellulosic raw  
material an organic solvent at  
ure to liberate cellulosic  
us methods have been  
ethanol, methanol (with  
phenol, acetic acid, for-  
mycerol, glycol, dioxane,  
 $\text{SO}_2$ ). No solvent pulping  
used on a full commercial  
scale demonstrated at the

**BS:** Proposed scheme to  
kraft pulps by reducing  
work in order to redeposit

**BSOR:** Liquor separated  
chemical cook, containing  
chemicals and the dissolved  
Syn. Residual Pulping  
Liquor.

**SPENT SULFITE LIQUOR:** Liquor separated  
from the pulp following a sulfite cook, containing  
the residual cooking chemicals and the dissolved  
constituents of the wood. Syn. Red Liquor.

**SPHERICAL DIGESTER:** Rotary digester of  
spherical construction. Syn. Globe Digester.

**SPRAY COOLING:** Method of cooling and  
absorbing  $\text{SO}_2$  gas during preparation of cooking  
acid in which water in finely divided form is con-  
tacted with the sulfur burner gas in two stages. In  
the first stage, the hot gas is saturated with water  
vapor to drop the temperature; in the second stage,  
water vapor is condensed and  $\text{SO}_2$  gas is absorbed.

**STEAMING:** Treatment of chips with steam in a  
separate vessel before they enter a continuous  
digester. The objective is to pre-heat the chips and  
remove air from the chip mass. See also PRE-  
STEAMING.

**STEAMING VESSEL:** Vessel in a continuous  
cooking system through which chips are conveyed  
and exposed to a displacement flow of steam which  
heats the chips and flushes out air and other non-  
condensibles.

**STEAM-PHASE DIGESTER:** Cooking vessel  
in which impregnated chips are heated with direct  
steam to bring them up to the cooking temperature.

**STORAGE ACID:** Raw acid held in reserve for  
later transfer to the sulfite mill accumulators.

**STRAINER:** Perforated ring on the inside surface  
near the midpoint of a batch digester through which  
liquor is extracted and circulated during a cook.

**SULFATE PROCESS:** See KRAFT PROCESS.

**SULFATE PULP:** See KRAFT PULP.

**SULFIDATION:** Chemical substitution of sulfide  
ions for hydrogen atoms. Sulfidation of lignin is a  
minor reaction during alkaline pulping processes.

**SULFIDE:** See SODIUM SULFIDE.

**SULFIDITY:** With respect to white liquor or  
green liquor, the ratio of sodium sulfide ( $\text{Na}_2\text{S}$ ) con-  
centration to either active alkali concentration or to  
total titratable alkali concentration, all in terms of  
equivalent sodium oxide ( $\text{Na}_2\text{O}$ ), usually expressed  
as a percentage. The basis of white liquor sulfidity  
must be specified.

**SULFITATION:** Reaction of  $\text{SO}_2$  gas with a base  
chemical to produce sulfite or bisulfite cooking  
liquor.

**SULFITE PROCESS:** Generic term for any  
chemical pulping process employing sulfurous acid  
and/or bisulfite or sulfite ions as the primary or  
secondary delignification chemicals. Generally a  
qualifying term is prefixed. See also ACID SUL-  
FITE PROCESS, BISULFITE PROCESS, NSSC  
PROCESS, ALKALINE SULFITE PROCESS,  
MULTI-STAGE SULFITE PROCESS.

**SULFITE PULP:** Pulp manufactured by any sul-  
fite process.

**SULFONATION:** Chemical substitution of  $\text{SO}_3\text{H}$   
groups for hydrogen atoms. The sulfonation of ligin-  
in is a major mechanism for lignin dissolution  
during sulfite pulping.

**SULFUR:** (S) Yellow nonmetallic element, used as  
raw material for makeup of sulfur dioxide. It is also  
used as a makeup chemical in the kraft recovery  
cycle and for polysulfide formation.

**SULFUR BURNER:** Furnace used for the con-  
trolled burning (oxidation) of elemental sulfur into  
sulfur dioxide.

**SULFUR DIOXIDE:** ( $\text{SO}_2$ ) Toxic gas formed  
readily by burning sulfur in air or by roasting pyrite.  
Aqueous sulfur dioxide (solution of sulfur dioxide in  
water) and the metallic salts are used extensively in  
acidic and high-yield pulping processes. Aqueous  
sulfur dioxide is also used in pulp bleaching.

**SULFUROUS ACID:** Solution of sulfur dioxide  
( $\text{SO}_2$ ) in water. Since the actual compound, "sul-  
furous acid" ( $\text{H}_2\text{SO}_3$ ), has been shown not to exist,  
the term "aqueous  $\text{SO}_2$ " has been suggested as a  
better descriptive term.

**SULFUR TRIOXIDE:** ( $\text{SO}_3$ ) Toxic gas formed  
by further oxidation of sulfur dioxide (under certain  
conditions) which forms sulfuric acid ( $\text{H}_2\text{SO}_4$ )  
when dissolved in water. Sulfur trioxide is an  
undesirable byproduct when burning sulfur for sul-  
fite cooking liquor preparation. In sulfuric acid  
plants, a heated catalyst is used to promote oxida-  
tion to the trioxide form.

**SURGING:** Sudden changes in process inputs dur-  
ing batch cooking to promote circulation and  
improve temperature uniformity. Examples of surg-  
ing techniques are digester "bumping" and  
"burping".

**T** \_\_\_\_\_  
**TARGET PLATE:** Surface within a blow tank  
where the discharging pulp/liquor/steam mixture  
from a batch digester first impinges.

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